



Philadelphia University
Faculty of Science
Department of Basic Sciences and Mathematics
Fall Semester 2008/2009

<u>Course Syllabus</u>			
Course Title	Special Topics	Course Code	250474
Course Level	"4"	Course Prerequisite	Department Agreement
Lecture Time	Sun. Tue. Thu. 14:10–15:00	Credit Hours	"3"

<u>Academic Staff Specific</u>				
Name	Feras Awad Mahmoud	Office Hours	Sun.	08:10 – 09:00
Rank	Lecturer "M.Sc"		Mon	09:45 – 11:15
Office Number	"1019"		Tue.	09:10 – 10:10
Location	Faculty of Science		Wed.	12:45 – 14:15
E – mail	fawad@philadelphia.edu.jo		Thu.	11:10 – 12:00

Course Description:

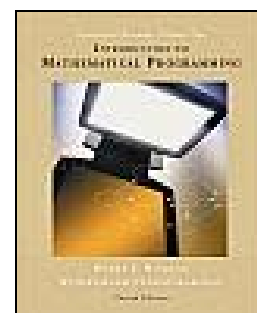
This course will be an introduction to mathematical programming, with an emphasis on techniques for the solution and analysis of deterministic linear and nonlinear models. The primary types of models to be addressed will be linear programming: applications and advances. However, the course will touch on more complex models. The main emphasis will be on solution techniques and on analysis of the underlying mathematical structure of these models. As a supporting theme, the course will also emphasize the use of mathematical solvers, such as TORA, LINDO and Mathematica.

Course Objectives: The goals of this course are for students to:

1. Improve their ability to rigorously prove mathematical statements.
2. Cultivate an ability to analyze the structure of and mathematically model various complex systems occurring in industrial applications.
3. Develop knowledge of the mathematical structure of the most commonly used deterministic linear optimization models.
4. Develop an understanding of the techniques used to solve linear optimization models using their mathematical structure.
5. Develop knowledge of existing solvers for linear optimization.

Course components (Text Book):

Title	: Introduction to Mathematical Programming
Author	: Winston, Venkataramanan
Publisher	: Brooks/Cole.
Edition	: 4 th Edition.
Year	: 2003
ISBN	: 0534359647



Teaching methods:

1. There are many different styles of learning. Some people gain better understanding from listening to something being explained orally. Some get better understanding from written material. Some like a combination of both. I do my best to accommodate various styles of learning. However, feel free to let me know what your learning style is so that I can take that into account when determining the future direction of the course.
2. There will be required readings associated with each lecture. Most readings will be from the course text, but students are encouraged to seek supplementary material. Links to supplementary reading material can be accessed from the course page.
3. Assignments will be given according to the course timeline below. There will be nine problem sets and nine projects.
4. I encourage the use of research materials as a way to supplement your understanding of the course material, as long as you heed the following common-sense ground rules. First, you may not consult my solutions or the problems sets of other students from previous offerings of this course. Second, external sources may be used only to improve your own understanding. You may not quote directly from any source and you should not write down anything that you do not understand. When you write your solutions, you should do it on your own without the direct help of any external sources. If you do use external references in improving your understanding, please cite them! Failure to cite references will be treated as cheating and will not be tolerated. If you are diligent about citing references, you will come out ahead in the end. Please ensure that you understand the spirit and the letter of these rules before beginning any class work.
5. You are encouraged to work together on problem sets, especially those designated as group work. However, unless the problem set is specifically designated as group work, you must ultimately demonstrate your understanding of the material by writing up your own solutions without the help of other students or their written work. If you consult with other students (or faculty) on a problem set, this should be considered equivalent to consulting any other reference and should be cited appropriately. This policy will be strictly enforced.
6. All assignments should be submitted electronically by e-mailing a file to the instructor by the beginning of the class period in which the assignment is due. The official turn-in time of the assignment will be the time stamp on the e-mail. The file should have the name `<*>-HW(**)` where the `"**"` is replaced by your name and the `"**"` is replaced by the assignment number, and the subject of the e-mail should be `"Math492 Assignment *"` where `"**"` is replaced by the assignment number.
7. Higher learning involves not just acquiring knowledge, but developing the ability to know what you don't know. Among other things, this involves the ability to know when you do and do not have a rigorous proof or an accurate answer. One of the goals of this course is to cultivate your ability to perform an accurate self-assessment of your work. Hence, you are encouraged to think about and state accurately not only the parts that you do understand from each homework, but also the parts that you do not. Please do not muddle your way through proofs and other exercises in the hope that I will not read them carefully. You will get additional credit for an accurate self-assessment of your answer or approach. If you have gotten most of the way through a proof and just cannot complete the last step or even if you are missing a step in the middle but know how to do the rest, just try to write down what you have done so far and what it is that you don't know how to do. This will help me to better gauge where your understanding is incomplete so that we can review these areas in class. It will also demonstrate your understanding of your own work.
8. Effective learning also involves knowing where to go to get help when you realize that your knowledge or understanding of a topic is incomplete. This could mean

consulting external references or coming to office hours. It can also mean asking a question in class when you don't understand part of the lecture.

9. I very much appreciate and enjoy getting as much feedback from my students as possible, even if it is not all positive. Please don't be afraid to tell me what you think. If you want to just stop by to chat, feel free. My door is usually open, but if you could utilize office hours as much as possible, I would appreciate it. If you would like to make an appointment outside office hours, just call or send an e-mail.

Learning outcomes:

- ❖ Knowledge and understanding.
To instill in the student an ability to recognize potential linear programming problems, formulate such problems as linear programming models and employ the proper computational techniques to solve these problems
- ❖ Cognitive skills (thinking and analysis).
To identify and solve problems. Work with given information and handle mathematical calculations based on mathematical formulas.
- ❖ Communication skills (personal and academic).
Encourage the students to be self starters (creativity, decisiveness, initiative) and to finish the mathematical problems properly (flexibility, adaptability). Also to improve general performance of students through the interaction with each other in solving different Mathematical problems.
- ❖ Practical and subject specific skills (Transferable Skills).
Gaining knowledge and experience of working with many applied mathematical problems and models.

Assessment instruments

Allocation of Marks	
Assessment Instruments	Mark
First Examination	20
Second Examination	20
Quizzes and Projects	10
Final Examination	50
Total	100

Course academic calendar

Week	Basic and support material to be covered
(1)	Chapter Three: Introduction to Linear Programming. 1. What is a linear programming problem? 2. The graphical solution of two-variable linear programming problems.
(2)	3. Special cases. 4. The formulation of LP problems. 5. Computer solution with LINDO and TORA.
(3)	Chapter Four: The Simplex Algorithm and Goal Programming. 1. How to convert an LP to standard form. 2. Preview of the simplex algorithm. 3. The simplex algorithm. 4. Using the simplex algorithm to solve minimization problems.
(4)	5. Alternative optimal solutions. 6. Unbounded LPs.
(5)	7. Degeneracy and the convergence of the simplex algorithm. 8. The big M method 9. The two-phase simplex method.

(6) First examination	10. Unrestricted in sign variables Chapter Six: Sensitivity and Duality. 1. A graphical introduction to sensitivity analysis. 2. Some important formulas.
(7)	3. Sensitivity analysis.
(8)	4. Finding the dual of an LP. 5. Economic interpretation of the dual problem.
(9)	6. The dual theorem and its consequences. 7. Shadow prices.
(10)	Holiday of Eid Al Adha.
(11) Second examination	8. Duality and sensitivity analysis.
(12)	9. Complementary Slackness. 10. The dual simplex method.
(13)	Chapter Seven: Transportation, Assignment, and Transshipment Problems. 1. Formulating transportation problems. 2. Finding basic feasible solutions for transportation problems.
(14)	3. The transportation simplex method. 4. Assignment problems. 5. Transshipment problems.
(15)	Chapter Twelve: Nonlinear Programming. 1. Convex and Concave Functions. 2. Unconstrained maximization and minimization with several variables. 3. The method of steepest ascent.
(16)	Final Exam.

Expected workload:

On average students need to spend, at least, 9 hours of study and preparation per week for this course.

Attendance policy:

Absence from lectures shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Module references:

Title : Operations Research: An Introduction
Author : Hamdy A. Taha.
Publisher : Prentice Hall.
Edition : 8th Edition.
Year : 2007
ISBN : 0131889230



Website:

<http://ecourse.philadelphia.edu.jo/login/index.php>

Remark: The user name and password, if any, is the student university number.